APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE: WIRELESS ENABLED TOUCH PAD POINTING DEVICE WITH INTEGRATED REMOTE CONTROL FUNCTION

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BACKGROUND OF THE INVENTION

[0001] In the digital home, personal computers (i.e., PCs) and consumer electronics devices work together to deliver digital media to the parts of the home where a user would want it. The user already can enjoy the power and flexibility of digital media - taking photos with a digital camera, collecting MP3s from favorite artists, and recording TV shows on a digital hard drive. Now, with the convergence of consumer electronics and PC technology, a user can easily and conveniently enjoy this content across different network-enabled devices and locations in the user's home.

[0002] Perfect for home entertainment, the home PC is evolving into a digital media hub that brings together a user's digital media content and allows the user to access video, music and images with a remote control. PCs for the digital home come equipped with all the necessary components to deliver computing power and an enjoyable home entertainment experience.

[0003] By itself, a PC for the digital home is capable of turning any room in a user's home into a multimedia entertainment center - where a user can enjoy the convenience of remote control access for watching TV, playing DVDs, and listening to music. Combined with a digital media adapter, a user's PC for the digital home can wirelessly distribute digital video, photos and music to the user's stereo or TV. However, such remote controls do not currently include pointing devices.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Preferred embodiments of the invention will now be described in connection with the associated drawings, in which:

[0005] Figure 1 depicts an orthogonal view of a first side of a wireless enabled touch pad pointing device with integrated remote control function; and

[0006] Figure 2 depicts an orthogonal view of a second side of a wireless enabled touch pad pointing device with integrated remote control function.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0007] In the following description and claims, the terms "connected" and "coupled," along with their derivatives, may be used. It should be understood that these terms are not intended as synonyms for each other. Rather, in particular embodiments, "connected" may be used to indicate that two or more elements are in direct physical or electrical contact with each other. In contrast, "coupled" may mean that two or more elements are in direct physical or electrical contact with each other or that the two or more elements are not in direct contact but still cooperate or interact with each other.

[0008] An algorithm is here, and generally, considered to be a self-consistent sequence of acts or operations leading to a desired result. These include physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated. It has proven convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, terms, numbers or the like. It should be understood, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities.

[0009] Unless specifically stated otherwise, as apparent from the following discussions, it is appreciated that throughout the specification discussions utilizing terms such as "processing," "computing," "calculating," "determining," or the like, refer to the action and/or processes of a computer or computing system, or similar electronic computing device, that manipulate and/or transform data represented as physical, such as electronic, quantities within the computing system's registers and/or memories into other data similarly represented as physical quantities within the computing system's memories, registers or other such information storage, transmission or display devices.

[0010] In a similar manner, the term "processor" may refer to any device or portion of a device that processes electronic data from registers and/or memory to transform that electronic data into other electronic data that may be stored in registers and/or memory. A "computing platform" may comprise one or more processors.

[0011] Moreover, a "pointing device" may comprise any input device that is used to move the pointer on the computer screen. Examples are the mouse, stylus, trackball, pointing stick, and touch pad.

[0012] Figure 1 depicts a system in which embodiments of the present invention may be implemented. In Figure 1, the system may include a first side of a wireless enabled touch pad pointing device 100 with integrated remote control function. The device 100 may include means for powering the device 100 on, such as an on button 109. Since device 100 is adapted to be used in a multimedia digital home environment, it may also include a plurality of personal video recorder (i.e., PVR) control buttons 118. Similar such means 118 can be conventionally used to provide fast forward means (e.g., four speeds:4x, 15x, 60x or 300x), fast reverse means (e.g., four speeds: 4x, 15x, 60x or

300x), skip forward means, skip back means, and pause means. The plurality of buttons or control means 118 may also include stop and record means.

[0013] A second plurality of buttons or control means 127 may also provide the means for scrolling up, down, left and right, and selecting a function by pressing an "OK" button. Select means 138 may also be provided to enable the user to select from pictures, video, television, and music. A channel up (i.e., "+") or down (i.e., "–") button 145 can be used to select channels on a television, while volume can be controlled by means 154 to volume up (i.e., "+") or down (i.e., "–") and mute the sound.

[0014] A numeric keypad 163 can also be provided to input numeric data. An enter button 172, or similar such means, can be used to enter to numeric data input by use of the numeric keypad 163, while a clear button 181, or similar such means, can be used to clear such numeric data. The device 100 also may include a pair of buttons 190 on either side thereof to provide left and right mouse button means.

[0015] Figure 2 depicts the other side of a wireless enabled touch pad pointing device 100 with integrated remote control function. Such side includes a pointing device 209, such as a touch pad.

[0016] Conventional touch pads work by sensing an electrical phenomenon called capacitance. Whenever two electrically conductive objects come near to each other without touching, their electric fields interact to form capacitance. The surface of a touch pad is a grid of conductive metal wires covered by an insulator such as Mylar®. The human finger is also an electrical conductor. When a user's finger is placed on a touch pad, a tiny capacitance forms between the user's finger and the metal wires in the touch pad. Certain touch pads (e.g., those manufactured by Synaptics Incorporated of San Jose,

California) use a diamond chain pattern for the wires that maximizes capacitive contact with the user's finger. The Mylar® insulator keeps the user's finger from actually touching the wires and is textured to help the user's finger move smoothly across the surface.

[0017] Touch pad's sensitive analog electronics measure the amount of capacitance in each of the wires. By seeing when the capacitance increases, the touch pad can tell when the user's finger is touching. By seeing which wires have the most capacitance, the touch pad can also locate the user's finger to an accuracy better than 1/1000th of an inch. The sensing electronics are typically inside an application specific integrated circuit (i.e., ASIC) on the back side of the touch pad. The ASIC also may include a microprocessor that computes the finger's position and speed and reports them to the main computer in the form of cursor motion. The ASIC may also detect when the user taps on the pad, and converts those taps into simulated mouse button clicks.

[0018] Touch pads can work with any mouse driver, but a Synaptics TouchPad™, for example, works best with the Synaptics driver. When used with the Synaptics driver, a Synaptics TouchPad reports not just the mouse-like motion of the finger, but also the absolute position of the finger on the TouchPad surface as well as the amount of finger pressure. The driver uses this information to enhance the user interface in a variety of ways. For example, if the finger moves up and down along the right-hand edge of the pad, the driver can activate a "virtual scrolling" feature. Synaptics has developed drivers for operating systems like Windows, Windows CE, Linux, and others. In addition, a general purpose TouchPad Application Programming Interface (API) is available, which allows adaptation of such touch pads into products such as cell phones and PDAs.

[0019] Capacitive sensing technology in touch pads has numerous advantages over other technologies like membrane switches and resistive sensors. Its solid-state construction makes it extraordinarily rugged. And, because a touch pad sensor is just a grid of wires, it can be made extremely thin, lightweight, flexible, or even transparent. The onboard microprocessor makes it easy to build custom touch pads for special needs.

[0020] Such proven capacitive sensing technology can also work for force sensors. In a force sensor, two metal plates are held close together, usually separated by an air gap. Force applied on the plates changes the capacitance between them. Synaptics, for example, has developed a capacitive force sensing technology suitable for applications as diverse as joysticks, vacuum gauges, high-resolution pressure sensors, and toys.

[0021] Other forms of pointing devices may be used in further embodiments of the present invention. A pointing stick, for example, may be employed. Pointing sticks can be built using capacitive force sensing technology. Like other pointing sticks, such pointing sticks sense the force of the finger applied to a small rubber cap. Where some pointing sticks use strain gauges, others measure force capacitively. The rubber cap of such pointing sticks is connected to a metal plate mounted above a capacitive sensor.

[0022] The metal plate naturally creates a capacitance with the sensor. As the user presses on the cap, the plate deforms slightly. The ASIC senses this motion and translates it into cursor motion. When the user presses down on the cap, the ASIC senses the overall change in capacitance to implement a "press-to-select" feature.

[0023] Touch pads and pointing sticks can be used together in the same device. In such a dual pointing system, the touch pad connects to the pointing stick and passes the

pointing stick motion information on to the computer. This allows both devices to be used without adding any new ports to the computer hardware.

[0024] Still other forms of pointing devices may be used in still further embodiments of the present invention. Known transparent capacitive position sensing technology operates in a manner very similar to other known capacitive sensing technology. To capacitively locate a finger, sense wires are formed using transparent conductors. Most commonly, indium tin oxide (ITO) is used, and can be placed over polyester (PET), polycarbonate, glass or any viewable surface.

[0025] Further, two-dimensional transparent capacitive position sensing technology utilizes a grid of these ITO sensors to accurately locate the X, Y and "pressure" of a finger on a sensor. Typically, ITO-coated PET is etched to form a one-dimensional array of wires. Two layers of this sensor are bonded together using an optical adhesive. This provides a strong, simple, and flexible sensor that can be placed in front of a display.

[0026] The most common alternative to transparent capacitive sensing is resistive technology. In a typical resistive touchscreen, two layers of ITO-coated PET are separated by an air gap. When the screen in pressed, the top layer bends to make contact with the bottom layer. Placing a voltage gradient across the top ITO layer, and then measuring the voltage on the bottom layer can calculate the point of contact. That is, a resistive touchscreen technology is akin to a potentiometer.

[0027] This capacitive solution is utilized in the Synaptics ClearPad™ product, for example. It is completely solid state, with no moving parts. It has the durability of its rigid components. In contrast, resistive screens are physical switches that must flex and rub throughout their useful lifetime.

[0028] Because capacitance can be sensed through most materials, ClearPad designers are not limited to pliable surface materials as required by resistive sensing technology. Capacitive sensing operates even when the sensor is placed underneath a durable surface, such as polycarbonate or acrylic. In this situation, the ClearPad has the environmental durability of its rigid overlay, and allows the ClearPad to function in environments where other technologies fail. PDA's that utilize resistive technology require protective covers that must be opened before they can be used.

[0029] The ClearPad is optically simpler than the resistive touch panel. Refractive index-matched adhesives can be used, and the lack of an air gap and spacer dots provide for fewer internal reflections. Absorption of light is also minimized, because very thin ITO is used. In contrast, the physical stack-up of a resistive panel requires the use of an air gap, and steps must be taken to minimize the loss of light as it passes through layers with differing refractive indices.

[0030] Preferably, the remote control means on the first surface of the pointing device 100 according to embodiments of the present invention and the input device 209 on the second surface, as well as the buttons 190 on opposing sides of the pointing device 100 are remotely coupled to a user's PC (not shown) by means of suitable wireless technology. One such suitable means is "Bluetooth", which is a short-range (2.4 GHz) radio technology that simplifies communications among networked devices and between devices and the Internet. It also simplifies data synchronization between networked devices and other computers. Because Bluetooth isn't designed to carry heavy traffic loads, it is not typically a suitable technology for replacing LANs or WANs.

[0031] Embodiments of the present invention may include apparatuses for performing the operations herein. An apparatus may be specially constructed for the desired purposes, or it may comprise a general-purpose device selectively activated or reconfigured by a program stored in the device.

[0032] Embodiments of the invention may be implemented in one or a combination of hardware, firmware, and software. Embodiments of the invention may also be implemented as instructions stored on a machine-readable medium, which may be read and executed by a computing platform to perform the operations described herein. A machine-readable medium may include any mechanism for storing or transmitting information in a form readable by a machine (e.g., a computer). For example, a machine-readable medium may include read only memory (ROM); random access memory (RAM); magnetic disk storage media; optical storage media; flash memory devices; electrical, optical, acoustical or other form of propagated signals (e.g., carrier waves, infrared signals, digital signals, etc.), and others.

[0033] The invention has been described in detail with respect to various embodiments, and it will now be apparent from the foregoing to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects. The invention, therefore, as defined in the appended claims, is intended to cover all such changes and modifications as fall within the true spirit of the invention.